IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Patent Application of

NADIN — Atty. Ref.: 540-333

Serial No. 10/069,049 — Group: 2856

Filed: February 21, 2002 — Examiner: C. Garber

For: DETECTION OF FLUID LEAK SITES IN FLUID CONTAINERS

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APPEAL BRIEF

On Appeal From Group Art Unit 2856

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TABLE OF CONTENTS

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September 9, 2004

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

I. REAL PARTY IN INTEREST

The real party in interest in the above-identified appeal is BAE SYSTEMS plc by virtue of the Assignment from the inventor to BAE SYSTEMS plc recorded February 21, 2002 at Reel 12823, Frame 409.

II. RELATED APPEALS AND INTERFERENCES

There are believed to be no related appeals or interferences with respect to the present application and appeal.

III. STATUS OF CLAIMS

Claims 2 and 8 have been cancelled without prejudice, claim 7 allowed, claim 4 objected to and claims 1, 3, 5, 6 and 9 rejected in the outstanding Final Rejection. The Examiner contends that claims 1, 3, 5, 6 and 9 are obvious under 35 USC §103 in view of a combination of at least five cited prior art references. Claim 4 is only objected to and is indicated as containing allowable subject matter. Thus, claims 1, 3-6 and 9 are subject to this appeal.

IV. STATUS OF AMENDMENTS

No further response has been submitted with respect to the Final Official Action in this application.

V. SUMMARY OF THE INVENTION

The present invention relates to a method and apparatus for detecting the location of a fluid leak from a container and in particular the location of fluid leaks in aircraft.

In many vehicles, including large transport aircraft, the fuel tankage is comprised of a number of planar portions of aluminum alloy panel which are riveted or otherwise bonded together to form a fuel tank. Often the panels on at least one side of the fuel tank form the surface of the aircraft, either the upper and/or lower wing surfaces and/or portions of the fuselage surface. There are

numerous benefits in locating fuel storage in the aircraft wing (the wings generally contain large otherwise unoccupied volumes, and since the wings provide lift, the location of fluid in the wings avoids the necessity for increasingly robust I-beams from the fuselage to the wing to support the weight of the fuselage if located solely in the fuselage, etc.).

One problem with the locating of fuel tankage in a wing or fuselage in which a portion of the fuel tank is comprised of a plurality of sheets of aluminum alloy and is an external surface of the aircraft, is that there must be a seam or series of rivets or some other joining of the plurality of panels together. At such joint, no matter how carefully fabricated, there is the potential for leakage. Additionally, many such panels have removable inspection ports or other access panels which must be sealed to prevent fuel loss.

The loss of fuel from an aircraft in flight poses both a safety of flight issue (running out of fuel prior to one's destination and/or providing an explosion hazard) and also an environmental problem (the dumping of fuel is essentially the releasing of hydrocarbons into the atmosphere with the attendant smog and pollution problems created thereby). It is desirable to be able to test fuel tanks and in particular aircraft fuel tanks and indeed air leakage from pressurized cabins and the such.

Some leak test systems have involved utilizing trace amounts of radioactive gas in the fuel and measuring the level of radioactive emanations along the fuel

system, utilizing color dyes in the fuel and observing where that fuel leak occurs, the application of pressure to the tank and utilizing acoustic sensing to "hear" where the pressurized air is escaping, etc.

However, many of the above testing methods are not applicable or suitable in an aircraft or other lightweight fuel tank design. For example, if a substantial vacuum were applied to an aircraft fuel tank, the atmospheric pressure around the fuel tank would crush the tank and the resulting aircraft structure (a wing tank or a fuselage tank). The large volumes of aircraft tankage also presents difficulties in scanning the entire tank or scanning all seams for acoustic noise should internal pressure be applied to the tank. Again, there are limits on any internal pressure that can be applied to avoid destructive deformation of the tank.

Appellant found, when attempting to solve the problem of testing for sources of fluid leakage, especially in lightweight structures, that a small localized area of vacuum could be utilized on a tank without undue detrimental effect. Appellant subsequently found that the providing of a small localized area of the tank (including any suspect access panel or seam), measuring the vacuum decay and then comparing the measured vacuum decay rate with a datum vacuum value, i.e., a decay rate obtained over a similar known good surface, will provide an accurate indication of the existence of a leak.

Appellant found that the general location of a leak can be determined by this sequence of steps, and subsequently, by gaining interior access to the fluid

container, a specialized leak detector could be utilized to determine the exact location and to effect repair of the leak internally.

Appellant's providing of a circumferentially sealed cover over a "joint free and seam free surface of the fluid container" allowed the recording of a maximum consistent vacuum to be a "datum vacuum value." This provided a baseline which may vary depending upon the type of circumferential seal between the cover and variations in the surface finish of the panel, i.e., painted, polished aluminum, clear coat, etc. Since the surface of the "joint free and seam free surface" is generally the same as the surface over the potential source of fluid leakage (access plates, inspection ports and/or sealed joints and/or seams), the use of the "datum vacuum value" neutralized any differences in surface finish with some absolute vacuum value.

Thus, the present invention comprises a sequence of steps in which a "datum vacuum value" is determined by sealing a vacuum tight cover to a joint free and seam free surface of the container, removing air between the cover and the surface of the container and recording the maximum consistent vacuum achieved as the "**datum vacuum value**." Then a vacuum tight cover is circumferentially sealed over a potential source of fluid leakage to form a bagged region of the surface, air is removed between the cover and the bagged region of the surface and the resulting "**measured vacuum**" is determined.

Appellant's method and apparatus further includes "**comparing the measured vacuum with said datum vacuum value**" and, where the measured vacuum is less than the datum vacuum, providing the additional steps of "**gaining physical access**" to the interior of the container, "**using a leak detector to check suspect areas**" and "**recording the exact location of the source of fluid leaks**" are performed.

VI. ISSUES

Whether claims 1, 2 and 5 are obvious under 35 USC §103 over Johnston (U.S. Patent 5,404,747) in view of Newbill, Jr. (U.S. Patent 2,647,399), Schupack (U.S. Patent 4,979,390), Bogle (U.S. Patent 5,319,956) and Bosselaar (U.S. Patent 3,738,156).

Whether claims 3 and 9 are obvious under 35 USC §103 as unpatentable over Johnston, Newbill, Jr., Schupack, Bogle, Bosselaar, in further view of Nondestructive Testing Handbook ("NDT Handbook").

Whether claim 6 is obvious under 35 USC §103 as unpatentable over Johnston, Newbill, Jr., Schupack, Bogle, Bosselaar and further in view of Frenkel (U.S. Patent 5,182,941).

VII. GROUPING OF CLAIMS

The rejected claims stand or fall as being based upon independent claims 1, 3 and 9 as discussed in the argument portion of this Appeal Brief.

VIII. ARGUMENT

1. Discussion of the References

Johnston et al (U.S. Patent 5,404,747) teaches a portable leak testing apparatus for testing leaks across large sealed gaps. Specifically, Johnston places an elastomeric seal sheet over the gap so as to create a vacuum between the suspect area and the elastomeric seal sheet. A "listening tube or ultrasonic tester" are used to detect the sound made by air being pulled through the leak.

The Examiner has made a number of admissions in the Final Rejection with respect to the Johnston reference beginning on page 4, lines 12-14 ("Johnston however does not expressly seal the sheet or cover circumferentially which Examiner interprets to be a specific sealing feature along the cover periphery based on a reading of the specification"), page 5, lines 3-5 ("Johnston lacks measuring the vacuum between the cover and the sealed region of the surface; comparing the measured vacuum with a predetermined acceptable datum vacuum value, and, where the measured vacuum exceeds the datum vacuum"), page 6, lines 3-4 ("Johnston is unclear whether the detection device 95 is to be used on the outside of the structure or the inside upon gaining access as in the instant

invention") and page 6, lines 14-15 ("finally, Johnston does not expressly teach recording the exact location of the source of fluid leaks").

There is no allegation that Johnston recognizes or addresses the problem solved by the applicants invention. There is no disclosure of determining a datum vacuum or a measured vacuum or comparing the measured vacuum with the datum vacuum.

Newbill, Jr. (U.S. Patent 2,647,399) teaches an aircraft static testing apparatus for the application of aerodynamic loads simulating the expected pressure distribution on wings, fuselage, canopy and other portions of an aircraft. Newbill provides an approximation of a lower than atmospheric pressure on the surface of a structure by providing a metal plate equipped with an eye bolt and covering the plate with a suction sheet whereby a vacuum between the plate and the aircraft structure is created. Providing an outward force on the eye bolt and the plate allows the vacuum between the suction sheet and the aircraft structure to approximate lowered air pressure over the aircraft structure.

While Newbill teaches the sealing of the edges of the sheet, there is no recognition that this could be applied to the problem of measuring potential sources of fluid leakage in a fluid container. There is no disclosure of determining a datum vacuum or a measured vacuum or comparing the measured vacuum with the datum vacuum. Newbill simply has nothing to do with leakage determination.

Schupack et al (U.S. Patent 4,979,390) teaches an apparatus for testing the relative permeability of concrete materials. Schupack specifically teaches the use of a vacuum on a portion of a concrete surface and measuring the decay rate of that vacuum to provide an indication of the permeability of the concrete sample.

However, Schupack's testing of concrete samples are not to determine the location of a potential source of fluid leakage. Indeed, they measure the concrete's permeability against a reference surface, i.e., "a sheet for Formica" (column 10, line 45). Because Schupack is directed towards determining the permeability and thus the structural integrity of concrete surfaces, it is not directed towards or related to the determination of a source of leakage in a fluid container. There is no access to the interior of a fluid container, no use of a leak detector on the inside of a fluid container and no recording of a location of a potential source of fluid leakage.

There is no recognition in Schupack that anything disclosed in the Schupack reference could be remotely useful in solving the problem of determining the location of fluid leakage in a fluid container.

Bogle et al (U.S. Patent 5,319,956) teaches a method of confirming the presence of absence of leaks in a liquid storage container. However, there is no indication of how or where the source of such leaks are determined. The Examiner correctly notes that Bogle accomplishes determines the existence of a

leak by positioning a microphone inside a tank and listening for bubbles formed by outside air leaking into the tank filled with liquid.

There is no disclosure in Bogle of any method of locating the source of fluid leakage or any teaching of determining a datum vacuum value, a measured vacuum value or the comparing of the measured vacuum with the datum vacuum value to obtain a localized indication of the potential source of fluid leakage.

Bosselaar (U.S. Patent 3,738,156) teaches an apparatus and method for providing a leak detector which can be placed inside a pipeline system. A leak detector is transported along with the flow of fluid through the pipe and listens for ultrasonic acoustic signals indicating a leak to be present in the pipe.

Again, there appears to be no disclosure of determining datum vacuum values, measured vacuum values or a comparison therebetween in order to determine the potential source of fluid leakage in a tank.

The NDT Handbook ("Nondestructive Testing Handbook of the American Society for Nondestructive Testing") is cited as teaching the use of a short duration pressure test to calculate leakage rates to determine whether a "system under test is acceptable since its leakage rate is below the specified maximum allowable leakage rate." (See page 219). To the extent there is any teaching in the NDT Handbook, there is only acceptance testing, i.e., is the leakage rate low enough to be acceptable.

There is no suggestion or disclosure n the NDT Handbook of determining a datum vacuum value or comparing it with a measured vacuum value to locate a potential source of fluid leakage.

Frenkel (U.S. Patent 5,182,941) teaches a method of detecting leaks utilizing a surface film releasably bonded to the surface. Instead of any vacuum, gas pressure is applied on the opposite side of the surface from the releasably bonded film causing the film to bubble in the vicinity of a leak. The method according to Frenkel marks the location of bubbles, repairs the leak and again coats the surface and reestablishes pressurization until all leaks are repaired at which point the film is removed. A cross-sectional view of such a bubble created by the pressure is shown in Figure 3 of Frenkel.

There is no disclosure in Frenkel of any datum vacuum value or measured vacuum value being recorded or compared so as to provide an indication of the location of a potential source of fluid leakage. Moreover, Frenkel requires pressurization and clearly teaches away from the use of a vacuum or vacuum comparison.

2. Discussion of the Rejections

Claims 1, 2 and 5 stand rejected under 35 USC §103 as unpatentable over Johnston, Newbill, Jr., Schupack, Bogle and Bosselaar. To the extent the Examiner's rejection is understood, he admits that the primarily cited reference

Johnston does not teach the claimed datum vacuum value determination, the measured vacuum value determination or the comparison therebetween, but, to the extent the four additional references are cited, the Examiner apparently believes that those references teach the missing aspects of the Johnston patent.

The Examiner does not appear to allege that any of the five cited references address the problem solved by the presently claimed invention and apparently does not realize that some of these references teach away from Appellant's claimed combination.

Claims 3 and 9 stand rejected under 35 USC §103 as unpatentable over Johnston, Newbill, Jr., Schupack, Bogle and Bosselaar as previously applied and further in view of the NDT Handbook. Again, to the extent it is understood, the Examiner appears to believe that because aspects of the claimed invention may be disclosed in the five primary references, it would somehow be obvious to one of ordinary skill in the art to combine them with the teachings of the NDT Handbook in the manner of Appellant's claims 3 and 9.

Claim 6 stands rejected under 35 USC §103 as unpatentable over Johnston, Newbill, Jr., Schupack, Bogle and Bosselaar and further in view of Frenkel. Again, to the extent it is understood, the Examiner appears to believe that portions of Appellant's claimed invention are shown in one of the five cited primary references and that any missing feature is taught in the Frenkel reference.

The Examiner appears to ignore the requirement of some motivation for combining these six references in the manner of claim 6 and also appears to ignore the fact that the prior art would lead one of ordinary skill in the art away from such combination.

3. The Errors in the Final Rejection

There are at least three significant errors in the Final Rejection and they are summarized as follows:

(a) There is no disclosure of locating a potential source of fluid leakage in a fluid container by comparison of a datum vacuum with a measured vacuum;

(b) No prior art reference contains any suggestion for combining the five or six cited references; and

(c) Many of the cited references teach away from Appellant's independent claims.

(a) There is no disclosure of locating a potential source of fluid leakage in a fluid container by comparison of a datum vacuum with a measured vacuum

The Court of Appeals for the Federal Circuit, in discussing the burden on the Patent and Trademark Office with respect to obviousness rejections, has clearly stated that "the PTO has the burden under §103 to establish a *prima facie* case of obviousness." *In re Fine,* 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). The Court went on to say that the Patent Office "can satisfy this burden only by

showing some objective teaching in the prior art . . . ." *Id.* If the prior art references do not teach the recited method steps in Appellant's claim, that prior art does not support an obviousness rejection of the claims. It will be seen by review of each of Appellant's independent claims that the recited method steps are simply not present, even if all seven cited prior art references were combined.

Appellant's independent claims 1, 3 and 9 all are directed towards locating a potential source of fluid leakage in a **fluid container** (see lines 1 and 2 in claims 1, 3 and 9). This method includes the steps of "determining **a datum vacuum value**," "measuring the vacuum between the cover and the bagged region of the surface" to determine **the measured vacuum** and "comparing the measured vacuum with the datum vacuum value" (claim 1) or a similar method in which a time variation in vacuum is measured and compared (in claims 3 and 9).

As noted in the Discussion of the References, the Examiner has made multiple admissions indicating that the Johnston reference has nothing to do with determining the location of a potential source of fluid leakage in a fluid container. Additionally, it is clear that the Newbill, Jr., Schupack and Frenkel references have no bearing on such a method either. Only the Bogle, Bosselaar and NDT references make any reference to determining location of leaks. Bogle only determines whether or not leaks are present (no location), and Bosselaar determines the location of a leak only by the liquid flowing through a pipe, rather

than in a fluid container. While the NDT Handbook relates to leakage rates, it does not have anything to do with any location of a source of fluid leakage.

As a result of the above, none of the cited prior art references teach the method sequence of determining a datum value in a vacuum formed on the surface of a fluid container, measuring a vacuum between a cover and a bagged region of the surface of the container and then comparing the measured vacuum with the datum vacuum value to determine whether the bagged area is a potential source of fluid leakage.

The Examiner has not identified how or why the cited references teach Appellant's claimed method steps. Because the burden is on the Examiner to show that the claimed method steps are disclosed in at least one of the cited prior art references and because the Examiner has failed to meet this burden, he has failed to establish any case of obviousness of independent claims 1, 3 and 9 over any combination of the cited and applied prior art references.

(b) No prior art reference contains any suggestion for combining the five or six cited references

The rejection of claims 1, 2 and 5 over five cited references and the rejection of independent claims 3 and 9 over those same five references in addition to the sixth reference (NDT Handbook) is clear evidence that Appellant's combination is new, unique and unobvious. At best, the Examiner's rejection is a 20/20 hindsight reconstruction of Appellant's invention, with the Examiner

picking and choosing individual method steps from disparate references and then combining them in accordance with the manner disclosed in Appellant's specification. This is simply improper, as has previously been noted in Appellant's previous Amendment.

The Examiner's response in the "Response to Arguments" portion of the Final Rejection (page 2) is to cite a CCPA case published in 1971, i.e., more than 30 years ago, suggesting that hindsight reconstruction is proper. However, even if correctly applied, the Examiner also must take into account that such reconstructions may only take into account knowledge which was within the level of ordinary skill at the time the invention was made and "does not include knowledge gleaned only from the applicant's disclosure" as the Examiner admits in the Official Action (page 2, 2nd full paragraph). Here only the present specification and claims suggest the combination of the variously recited method steps.

Moreover, there are substantially more recent cases which have clarified how the Patent Office is to meet the burden of establishing that a combination of references would be obvious. The Court of Appeals for the Federal Circuit has held in the case of In re Rouffet, 47 USPQ2d 1453, 1457-8 (Fed. Cir. 1998) that

> "to prevent the use of hindsight based on the invention to defeat patentability of the invention, this court **requires the examiner to show a motivation to combine** the references that create the case of obviousness. In other words, **the Examiner must show reasons** that the skilled artisan, confronted with the same

> problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed." (emphasis added).

While the Examiner's rejection of independent claims 1, 3 and 9 contains clear admissions as to deficiencies in the Johnston reference, the Examiner has failed to identify any reference among the seven cited which suggests any recognition of the problem solved by the presently claimed invention, i.e., the location of potential sources of fluid leakage in a container for containing fluid. None of these cited references attempt to solve the problem solved by Appellant's claimed invention.

Clearly the Examiner has improperly used Appellant's specification and the recitation of Appellant's inventive method in the claims as a guide to picking and choosing method steps from diverse teachings in an attempt to support the improper rejection of the claims. The Examiner has simply failed to meet his burden of establishing a *prima facie* case of obviousness and has not provided any indication of a motivation or reason for combining portions of the various references.

(c) Many of the cited references teach away from Appellant's independent claims

The Court of Appeals for the Federal Circuit has consistently held that it is "error to find obviousness where references 'diverge from and teach away from

the invention at hand'." *In re Fine*, at 1599. Thus, if the cited prior art references would lead one of ordinary skill in the art away from Appellant's claimed combination of method steps, then those claimed combinations would be non-obvious, even if the references were somehow combined.

The Johnston reference suggests that a vacuum is applied to the external area of a sealed gap and then a separate testing apparatus is used to determine the passage of air through the sealed gap, i.e., teaches away from any vacuum comparison. Newbill, Jr. is unrelated to leak testing. Schupack teaches permeability testing of porous substrates and is unrelated to leak testing associated with a fluid container. Moreover, Schupack teaches vacuum decay of a Formica surface is compared with the vacuum decay of the measured concrete surface. Thus, Schupack clearly teaches away from establishing a datum vacuum value and then a measured value and comparing the two, i.e., the claimed combination of method steps.

Bogle teaches the use of a vacuum in a tank in order to induce the flow of outside air into the tank and the detection of leaks by appropriate microphones listening to noise generated by the leaks which method does not include any vacuum comparison step. Similarly, Bosselaar accomplishes similar listening for leaks. The NDT Handbook merely teaches how to calculate the rate of pressure drop permitted and then comparing that rate of pressure drop against a "maximum allowable leakage rate" to determine whether the system under test is acceptable

or not. The above have nothing to do with any leak location by means of a vacuum comparison and thus their suggestion of different techniques would lead one away from the claimed invention.

Frenkel teaches that instead of vacuum comparisons, one places a releasably bonded film onto the top surface, applying a gas pressure on the lower surface and determining where the pressure created bubbles occur. Those bubbles are indicative of a leak and the resultant discovered leak is fixed. The use of pressure clearly leads one away from Appellant's claimed method of vacuum comparisons.

As noted above, all of the cited references would lead one of ordinary skill in the art away from Appellant's combination of method steps which lead to a vacuum value comparison and therefore any further rejection of claims 1, 3 and 9 is respectfully traversed.

IX. CONCLUSION

The Examiner's citation of the Johnston reference as the primary reference in suggesting Appellant's claimed method is clearly defective. Johnston has nothing to do with the location of a leak in a fluid container by means of vacuum comparisons. None of the prior art references cited in combination with Johnston supply the missing method steps. Moreover, none of the cited prior art references have or contain any reason or suggestion for combining elements of the references

in the manner of Appellant's independent claims 1, 3 and 9. The necessity to combine 5 or 6 references is indicative of the non-obviousness of the claims. In fact, each of the cited references would clearly lead one of ordinary skill in the art away from Appellant's claimed combination of method steps.

Thus, and in view of the above, the rejection of claims 1, 3-6 and 9 over the cited prior art is clearly in error and reversal thereof by this Honorable Board is respectfully requested.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: ______________________
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SCS:kmm
Enclosures
Appendix A - Claims on Appeal

APPENDIX A

Claims on Appeal

1. A method of locating a potential source of fluid leakage in a fluid container for containing fluid includes the steps of:

(i) determining a datum vacuum value by circumferentially sealing a vacuum tight cover to a joint free and seam free surface of the fluid container;

(ii) removing the air between the cover and the surface of the container;

(iii) recording the maximum consistent vacuum achieved as the datum vacuum value;

(iv) circumferentially sealing a vacuum tight cover to a surface of the empty fluid container over a suspected source of fluid leak to form a bagged region of said surface;

(v) removing the air between the cover and said bagged region of the surface;

(vi) measuring the vacuum between the cover and said bagged region of the surface;

(vii) comparing the measured vacuum with said datum vacuum value, and, where the measured vacuum is less than the datum vacuum;

(a) gaining physical access to the interior of the fluid container;

(b) using a leak detector to check suspect areas from the inside of said fluid container; and,

(c) recording the exact location of the source of fluid leaks.

3. A method of locating a potential source of fluid leakage in a fluid container for containing fluid including the steps of:

(i) circumferentially sealing a vacuum tight cover to a surface of the empty fluid container over a suspected source of fluid leak to form a bagged region of said surface;

(ii) removing the air between the cover and said bagged region of the surface;

(iii) measuring the vacuum between the cover and said bagged region of the surface;

(iv) measuring the vacuum between the cover and said bagged region of the surface of the container over a predetermined period of time; and

(v) comparing a drop in measured vacuum with a predetermined acceptable drop in the datum vacuum value over the same predetermined time;

(vi gaining physical access to the interior of the fluid container;

(vii) using a leak detector to check suspect areas from the inside of said fluid container; and,

(viii) recording the exact location of the source of fluid leaks.

4. A method of locating a potential source of fluid leakage in a fluid container as claimed in claim 1 and further including the step of using a leak detector to detect air

leakage from said bagged region of the surface after the step of removing the air between the cover and the surface and if air leakage is detected appropriately repairing the cover or its seal to the surface.

5. A method of locating a potential source of fluid leakage in a fluid container as claimed in claim 1 and wherein the leak detector used is an ultrasonic leak detector.

6. A method of locating a potential source of fluid leakage in a fluid container as claimed in claim 1 and, where a potential source of leakage is located, including the further steps of:

repairing the source;

repeating the method and repairing any further sources found; and

filling the container with fluid and monitoring it for fluid leaks.

9. A method of locating a potential source of fluid leakage in a fluid container for containing fluid including the steps of:

(i) circumferentially sealing a vacuum tight cover to a joint free and seam free surface of the fluid container;

(ii) removing the air between the cover and said surface;

(iii) measuring the change in vacuum for a predetermined period of time;

(iv) circumferentially sealing a vacuum tight cover to a surface of the empty fluid container over a suspected source of fluid leak to form a bagged region of said surface;

(v) removing the air between the cover and said bagged region of the surface;

(vi) measuring the change in vacuum between the cover and said bagged region of the surface of the container over said predetermined period of time;

(vii) comparing the measured change in vacuum at said bagged region with the measured change in vacuum at said joint free and seam free surface, and, if the change in vacuum at said bagged region is greater than the change in vaccum at said joint free and seam free surface,

(a) gaining physical access to the interior of the fluid container;

(b) using a leak detector to check suspect areas from the inside of said fluid container; and,

(c) recording the exact location of the source of fluid leaks.